WHAT IS CLAIMED IS:

1. A laser comprising:

first and second elongated electrodes, said electrodes arranged spaced apart and face-to-face to define a gap therebetween, said gap being filled with a lasing gas;

at least a first solid dielectric insert extending longitudinally along the length of said electrodes, a first portion of said first insert being located between said electrodes in contact therewith and a second portion of said first insert extending laterally beyond corresponding first outer edges of said electrodes, said first portion of said first insert having a width less than the width of said electrodes;

a pair of mirrors configured and arranged to define a laser resonant cavity extending through said elongated gap;

means for exciting said lasing gas to create a gas discharge, thereby causing laser radiation to circulate in said resonant cavity; and

wherein the height of said gap is selected such that said gap forms a waveguide for said laser radiation in the height direction, and the width of said gap is selected such that said laser radiation is allowed to propagate in free space in the width direction of said gap in a manner controlled by said configuration and arrangement of said mirrors.

2. The laser of claim 1, wherein said means for exciting the gas includes an RF generator, the output of which is coupled to one of said electrodes.

3. The laser of claim 1, wherein said first portion of said insert has a width greater than or equal to about 30% of the width of said electrodes and less than or equal to about 70% of the width of said electrodes.

4. The laser of claim 1, wherein said second portion of said insert extends a distance of about 2.0 millimeters of greater beyond said corresponding edges of said electrodes.

5. The laser of claim 1, wherein and edge of said first insert between said electrodes has a concave curvature, thereby forming a first concave wall extending along the length of said electrodes and bounding said gap on one side thereof.

6. The laser of claim 1, further including a second solid insert, said second dielectric insert extending longitudinally along the length of said electrodes, a first portion of said second insert being located between said electrodes in contact therewith and a second portion of said second insert extending laterally beyond corresponding second outer edges of said electrodes, said first portion of said insert having a width less than the width of said electrodes.

7. The laser of claim 6 wherein at least one of said dielectric inserts has at least one aperture extending laterally therethrough in fluid communication with said gap.

8. The laser of claim 7 wherein at least one of said dielectric inserts has a plurality of spaced-apart apertures extending laterally therethrough in fluid communication with said gap.

9. The laser of claim 6 wherein an edge of said first insert between said electrodes has a concave curvature and an edge of said second insert between said electrodes has a concave curvature, thereby forming first and second concave walls extending along the length of said electrodes and bounding said gap on opposite sides thereof.

10. The laser of claim 6, wherein said first portions of said first and second dielectric inserts have a total width greater than or equal to about 30% of the width of said electrodes and less than or equal to about 70% of the width of said electrodes.

12. The laser of claim 6, wherein said second portion of each of said inserts extends a distance of about 2.0 millimeters of greater beyond said corresponding edges of said electrodes.

13. The laser of claim 1, wherein there is only said first dielectric insert and wherein said gap is bounded along one side thereof by an edge of said first dielectric insert between said electrodes and is open on along an opposite side thereof, corresponding to corresponding second edges of said electrodes to facilitate flow of said lasing gas into said gap.

14. The laser of claim 13, wherein said electrodes are maintained spaced apart by at least one insulating clamp attached to said corresponding second edges of said electrodes.

15. The laser of claim 14, wherein said at least one and any other insulating clamps occupy in total less than about 20% of the length of said electrodes.

16. A laser comprising:

first and second elongated electrodes, said electrodes having a stepped-cross section with a thick portion thereof at one edge and a thin portion thereof at an opposite edge said electrodes arranged spaced apart with said thick portions thereof face-to-face and said thin portions thereof face to face;

a solid dielectric insert extending longitudinally along the length of said electrodes, a first portion of said first insert being located between said thin portions of said electrodes in contact therewith and a second portion of said first insert extending laterally beyond corresponding first outer edges of said electrodes, said first portion of said insert having a width corresponding to the width of said thin portions of said electrodes, an elongated gap being formed between said thick portions of said electrodes, said gap being filled with a lasing gas, said gap having a height and a width

the height of said gap being less than the height of said ceramic insert, and said gap being bounded on one side thereof by an edge of said dielectric insert and being open on an opposite side thereof corresponding to the edges of said electrodes at the thick portions thereof;

a pair of mirrors configured and arranged to define a laser resonant cavity extending through said elongated gap;

means for exciting said lasing gas to create a gas discharge, thereby causing laser radiation to circulate in said resonant cavity; and

wherein the height of said gap is selected such that said gap forms a waveguide for said laser radiation in the height direction, and the width of said gap is selected such that said laser radiation is allowed to propagate in free space in the width direction of said gap in a manner controlled by said configuration and arrangement of said mirrors.

17. The laser of claim 16, wherein said means for exciting the gas includes an RF generator, the output of which is coupled to one of said electrodes.

18. The laser of claim 16, wherein said first portion of said insert has a width greater than or equal to about 30% of the width of said electrodes and less than or equal to about 70% of the width of said electrodes.

19. The laser of claim 18, wherein said second portion of said insert extends a distance of about 2.0 millimeters of greater beyond said corresponding edges of said electrodes.

20. The laser of claim 19, wherein said edge of said insert bounding said gap has a concave curvature.

21. A laser comprising:

first and second elongated electrodes located in said enclosure, said electrodes having a stepped-cross section with a first and second thin portions thereof bounding a thick portion, said electrodes arranged spaced apart with said thick portions thereof face-to-face and said thin portions thereof face-to-face;

first and second dielectric inserts extending longitudinally along the length of said electrodes, a first portion of said first insert being located between said first thin portions of said electrodes in contact therewith and a second portion of said first insert extending laterally beyond corresponding first outer edges of said electrodes, a first portion of said second insert being located between said second thin portions of said electrodes in contact therewith and a second portion of said second insert extending laterally beyond corresponding second outer edges of said electrodes, said first portions of said inserts having a width corresponding to the width of said thin portions of said electrodes, an elongated gap being formed between said thick portions of said electrodes, said gap being filled with a lasing gas, said gap having a height and a width, the height of said gap being less than the height of said ceramic insert, and said gap being bounded on opposite sides thereof by edges of said dielectric inserts, at least one of said dielectric inserts having an aperture extending therethrough in fluid communication with said gap;

a pair of mirrors configured and arranged to define a laser resonant cavity extending through said elongated gap;

means for exciting said laser gas to create a gas discharge, thereby causing laser radiation to circulate in said resonant cavity; and

wherein the height of said gap is selected such that said gap forms a waveguide for said laser radiation in the height direction, and the width of said gap is selected such that said laser radiation is allowed to propagate in free space in the width direction of said gap in a manner controlled by said configuration and arrangement of said mirrors.

22. The laser of claim 21, wherein said means for exciting the gas includes an RF generator, the output of which is coupled to one of said electrodes.

23. The laser of claim 21, wherein said first portions of said inserts have a total width greater than or equal to about 30% of the width of said electrodes and less than or equal to about 70% of the width of said electrodes.

24. The laser of claim 23, wherein said second portions of said inserts extend a distance of about 2.0 millimeters of greater beyond said corresponding edges of said electrodes.

25. The laser of claim 24, wherein each of said edges of said inserts bounding said gap has a concave curvature.

26. A laser comprising:

first and second elongated electrodes,

said first and second electrodes each having a stepped cross-section including a thick portion and a thin portion, said thin portion of said first electrode being wider than said thick portion of said second electrode, said electrodes having a step height defined by the difference in thickness between said thick and thin portions thereof;

said electrodes being arranged spaced apart and face-to-face with said thin and thick portions of said first electrode facing respectively said thick and thin portions of said second electrode, where the spacing between said electrodes being arranged such that an elongated discharge gap is formed between said thin portion of said first electrode and said thick portion of said second electrode, said discharge gap having a height and a width, said discharge gap width being about equal to the width of said thick portion of said second electrode and said discharge gap being filled with a lasing gas;

a solid dielectric insert extending longitudinally along the length of said electrodes, said insert having a height less than said step height and being located

between said thick portion of said first electrode and said thin portion of said second electrode and in contact therewith;

a pair of mirrors configured and arranged to define a laser resonant cavity extending through said elongated discharge gap;

means for exciting said lasing gas to create a gas discharge in said discharge gap, thereby causing laser radiation to circulate in said resonant cavity; and

wherein the height of said discharge gap is selected such that said gap forms a waveguide for said laser radiation in the height direction, and the width of said gap is selected such that said laser radiation is allowed to propagate in free space in the width direction of said gap in a manner controlled by said configuration and arrangement of said mirrors.

27. The laser of claim 26, wherein said dielectric insert has a width greater than the width of said thin portion of said second electrode, extends laterally beyond corresponding outer edges of said first and second electrodes and extends laterally beyond said thick portion of said first electrode toward said thick portion of said second electrode.

28. The laser of claim 27 wherein said dielectric insert is in contact with said thick portion of said second electrode.

29. A laser comprising:

first and second elongated electrodes,

said first and second electrodes each having a stepped cross-section, said first electrode including two thick portions bounding a thin portion and said second electrode including two thin portions bounding a thick portion, said thin portion of said first electrode being wider than said thick portion of said second electrode, said electrodes having a step height defined by the difference in thickness between said thick and thin portions thereof;

said electrodes being arranged spaced apart and face-to-face with said thin and thick portions of said first electrode facing respectively said thick and thin portions of said second electrode, spacing between said electrodes being arranged such that an elongated discharge gap is formed between said thin portion of said first electrode and said thick portion of said second electrode, said discharge gap having a height and a width, said discharge gap width being about equal to the width of said thick portion of said second electrode and said discharge gap being filled with a lasing gas;

two solid dielectric inserts extending longitudinally along the length of said electrodes, said inserts having a height less than said step height and one thereof being located between each said thick portions of said first electrode and said thin portions of said second electrode and in contact therewith;

a pair of mirrors configured and arranged to define a laser resonant cavity extending through said elongated discharge gap;

means for exciting said lasing gas to create a gas discharge in said discharge gap, thereby causing laser radiation to circulate in said resonant cavity; and

wherein the height of said discharge gap is selected such that said gap forms a waveguide for said laser radiation in the height direction, and the width of said gap is selected such that said laser radiation is allowed to propagate in free space in the width direction of said gap in a manner controlled by said configuration and arrangement of said mirrors.

30. The laser of claim 29, wherein each of said dielectric inserts has a width greater than the width of said thin portions of said second electrode and extend laterally beyond corresponding outer edges of said first and second electrodes and extend laterally beyond said thick portions of said first electrode toward said thick portion of said second electrode.

31. The laser of claim 30 wherein said dielectric insert is in contact with said thick portion of said second electrode.